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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR: Soon-Tae Ahn ) EXAMINER: Ip, Sikyin  
SERIAL NO.: 10/521,285 ) ) ART UNIT: 1742  
FILING DATE: July 03, 2003 ) ) DATE: July \_\_\_\_ 2006  
FOR: Quenched and )  
Tempered Steel Wire )  
with Superior Cold )  
Forging Characteristics )

DECLARATION UNDER RULE 132

Mail Stop \_\_\_\_\_  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

I, Soon-Tae Ahn [name], do hereby declare as follows:

1. I am an employee of Samhwa Steel Co., Ltd. ("Samhwa"), the assignee of the above-identified patent application entitled "Quenched and Tempered Steel Wire with Superior Cold Forging Characteristics." I hold the position of General Manager of R&D Center [title] at Samhwa.

2. I have a Doctor degree of Metal Engineering [ school degree] from Busan National University [school]. I have been employed by Samhwa since 1986 [year]. I have been involved in testing and production of steel wire since 1986 [year]. I am knowledgeable about and could testify if called as a witness regarding the subject matter of this declaration.

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3. I have been advised that the above-referenced application has been rejected on the basis of Japanese Application No. JP 09-067622, Ochi et al. U.S. Patent No. 5,252,153 and Nakagawa et al. U.S. Patent No. 3,666,572. I am familiar with the present invention and I have reviewed these prior art references.

4. A purpose of the present invention lies in providing, with no conventional spheroidization annealing, quenched and tempered steel wire which enables cold forging to manufacture a desired product with superior cold forging characteristics. The purpose of the invention is accomplished by the technical features defined in Claim 1. Specifically, steel wire according to the invention is obtained by the process of: wire rod → heating to a temperature above the  $A_3$  transformation point → water cooling → tempering (200°C -  $A_1$  transformation point) → cooling → steel wire. The steel wire produced by the process has a structure of a martensite base with spheroidized carbide.

5. The Ochi patent discloses a process for continuous heat treatment of low alloy steel which improves a reduction of area in drawing of wire rod without requiring an additional intermediate heat treatment for removing a work hardening effect. The process is comprised by the steps of: wire rod → heating to a temperature above the  $A_3$  transformation point → air cooling to a temperature of  $M_s$  with over the lower critical cooling rate → reheating (below the  $A_1$  transformation point) → air cooling → steel bar wire rod". The steel bar wire rod produced by the process is composed of a fine pearlite structure.

6. The Nakagawa patent relates to a hot rolling process for a steel bar wire rod being performed prior to conventional spheroidization annealing for providing an

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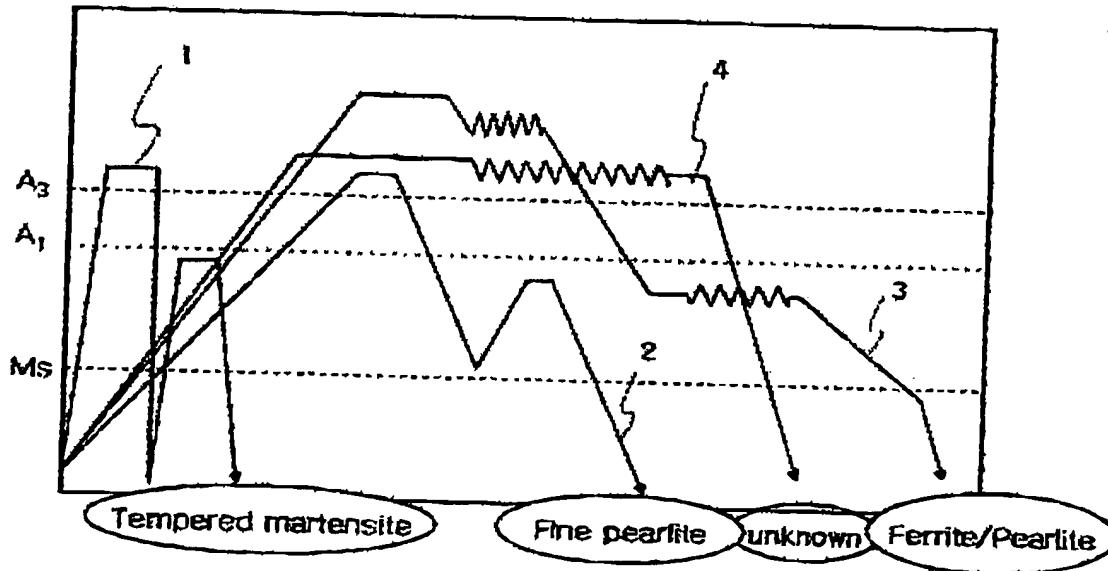
improved softening level which facilitates a subsequent cold working. The process is comprised of: Bloom  $\rightarrow$  heating (900°C - 1250°C)  $\rightarrow$  hot rolling ( $Ar_3$  -  $Ar_3 + 200^\circ C$  or  $Ar_{cm}$  -  $Ar_{cm} + 200^\circ C$ , with a total reduction of area 30% or more)  $\rightarrow$  cooling to the temperature range of  $Ac_1$  - ( $Ac_1 - 400^\circ C$ )  $\rightarrow$  finish hot rolling [ $Ac_1$  - ( $Ac_1 - 400^\circ C$  , reduction ratio of 10 - 70%)  $\rightarrow$  cooling to 300°C with a cooling rate of 1°C/sec  $\rightarrow$  steel bar wire rod. The steel bar wire rod shows ferrite/pearlite or pro-eutectoid cementite/pearlite in structure.

7. JP 09-067622 discloses a process for non-heat treated steel wire having low variation in tensile strength and lowered deformation resistance in cold forging. The process is comprised of: Bloom  $\rightarrow$  hot rolling  $\rightarrow$  cooling with a cooling rate of 2°C/sec or more  $\rightarrow$  wire rod  $\rightarrow$  drawing (with a reduction of area 25 - 35%)  $\rightarrow$  wire. The structure of the wire produced by the process is not disclosed, but is believed in a ferrite/pearlite et al., and not martensite, in view of the process and composition of wire described in the specification.

8. The difference between the present invention and prior art references may be clearly understood by the following Time-Temperature Curve of heat treatment, respectively:

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**Graph 1**

1. present invention 2. USP 3,666,572 3. USP 5,252,153 4. JP09-67622

9. As described above, the present invention shows a considerable difference with the prior art in the aspects of purpose, process and structure, respectively.

10. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment or both, under §1001 of Title XVIII of the United States Code and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

Name:

Sun Tae Ohn

Date

July 21, 2006